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Optimization of Surface Roughness and Vibration in Turning of Aluminum Alloy AA2024 Using Taguchi Technique

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Abstract : Determination of optimal conditions of machining parameters is important to reduce the production cost and achieve the desired surface quality. This paper investigates the influence of cutting parameters on surface roughness and natural frequency in turning of aluminum alloy AA2024. The experiments were performed at the lathe machine using two different cutting tools made of AISI 5140 and carbide cutting insert coated with TiC. Turning experiments were planned by Taguchi method L9 orthogonal array. Three levels for spindle speed, feed rate, depth of cut and tool overhang were chosen as cutting variables. The obtained experimental data has been analyzed using signal to noise ratio and analysis of variance. The main effects have been discussed and percentage contributions of various parameters affecting surface roughness and natural frequency, and optimal cutting conditions have been determined. Finally, optimization of the cutting parameters using Taguchi method was verified by confirmation experiments.

Keywords : turning, cutting conditions, surface roughness, natural frequency, taguchi method, ANOVA, S/N ratio
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